Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
AT&T Petition to Launch a Proceeding Concerning the TDM-to-IP Transition	)	GN Docket No. 12-353
Petition of the National Telecommunications Cooperative Association for a Rulemaking to Promote and Sustain the Ongoing TDM-to-IP Evolution	)	
Petitions for Rulemaking and Clarification Regarding the Commission's Rules Applicable to Retirement of Copper Loops and Copper Subloops	)	RM-11358

COMMENTS OF ADTRAN, INC.

The Commission is seeking comment on the petition of Mpower Communications Corp., U.S. TelePacific Corp. (together, TelePacific); ACN Communications Services, Inc.; Level 3 Communications, LLC; TDS Metrocom, LLC and Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI),[1] requesting that the Commission "refresh the record" and make certain changes to its copper retirement rules.[2] ADTRAN responds to this request by updating the record with regard to continuing developments in broadband over copper technologies and the capabilities that these advances support. As these comments demonstrate, copper is far from

[1] Letter of US Telepacific Corp. *et al*. Requesting Commission to Refresh Record and Take Expedited Action to Update Copper Retirement Rules, WC Docket Nos. 10-188, 12-353; GN Docket Nos. 09-51, 13-5; RM-11358 (filed Jan. 25, 2013).

[2] *Public Notice*, DA 13-147, released February 4, 2013.

obsolete. Rather, it is a vibrant and important component of broadband deployment both here and abroad.

ADTRAN, founded in 1986 and headquartered in Huntsville, Alabama, is a leading global manufacturer of networking and communications equipment, with an innovative portfolio of solutions for use in the last mile of today's telecommunications networks. ADTRAN's equipment is deployed by some of the world's largest service providers, as well as distributed enterprises and small and medium businesses. Importantly for purposes of this proceeding, ADTRAN solutions enable voice, data, video and Internet communications across copper, fiber and wireless network infrastructures. ADTRAN thus brings an expansive perspective to the issue of the current capabilities of copper loops to support broadband services.

ADTRAN can confirm the parties' claim that copper loop technology has advanced greatly since the initial implementation of the Telecommunications Act of 1996. As Telepacific Corp. *et al*. indicate in their submission at page 3:

> Almost since the ink was dry on the *Triennial Review Order* and the Commission's copper loop retirement rules, innovative companies have harnessed the innate capacity of embedded copper loop infrastructure. These companies, including equipment manufacturers and telecommunications carriers, have found ways to increase the capacity of copper loops and the broadband speeds that carriers can deliver over that loop infrastructure. In particular, the development of Ethernet over Copper ("EoC") technology makes broadband available to a large base of customers that previously did not have access to affordable broadband capacity because they were not located close enough to fiber networks. (footnotes omitted)

Broadband services provided over copper loops using Digital Subscriber Line (DSL) technologies continue to evolve, allowing carriers to take full advantage of the extensive base of copper loops that currently comprise much of the telecommunications plant in service. One means of increasing the capacity of DSL service is to utilize fully the multiple copper loops that have already typically been deployed to most homes by "bonding" those loops. Using VDSL2

technology and two-pair bonded loops, broadband download speeds of 80 Mbps can be provided on loop lengths up to 2500 feet. Alternatively, using ADSL2+ technology and two-pair bonded loops, the subscriber can get download speeds of 25 Mbps on loop lengths of up to 10,000 feet. And where there are additional loops (which may be the case for most residences, or for broadband service to businesses or to remote terminals), multi-pair bonding can be used to provide hundreds of Mbps download speeds.

One of the challenges limiting DSL performance is crosstalk between the loops within the same binder group in the network. A solution to mitigate crosstalk is vectoring, which uses advanced signal processing techniques to alleviate crosstalk. By performing the signal processing jointly among a group of lines at the DSL Access Multiplexer (DSLAM), rather than performing the signal processing on a line-by-line basis, the crosstalk can be significantly reduced or eliminated, thereby increasing capacity. Using vectoring, DSL download speeds of 100 Mbps can be provided on loops of up to 1800 feet over a single copper loop pair, or that same speed can be provided at up to 3400 feet with two-pair bonding. Vectoring thus provides significant enhancements on relatively short copper loops, and combined with bonding, it allows service on loops of up to 3400 feet at the 100 Mbps download speeds adopted as the longer term goal under the Commission's National Broadband Plan.[3] Moreover, advances in Outside Plant

[3] National Broadband Plan, Chapter 2, Goals for a High Performance America (available at http://www.broadband.gov/plan/2-goals-for-a-high-performance-america/):

> The United States must lead the world in the number of homes and people with access to affordable, world-class broadband connections. As such, 100 million U.S. homes should have affordable access to actual download speeds of at least 100 Mbps and actual upload speeds of at least 50 Mbps by 2020. This will create the world's most attractive market for broadband applications, devices and infrastructure.

DSLAMs (OSP DSLAMs) are making it more economical to limit the length of the DSL copper loops to the customer premises, so that these download speeds can be provided on a cost effective basis to many more subscribers.

Vectoring requires a system-level approach in order to allow the signal processing to be performed across the copper loop pairs in the binder group. The need for system-level signal processing does not mean, however, that vectoring is only possible if a single operator is providing service over the copper pair loops in the binder group. Through communication and coordination amongst different service providers, it is possible to have multiple OSP DSLAMs or chassis cards work together as a "system" to support vectoring in the binder loop.

These newer DSL technologies are being deployed as a means of providing an economical path to achieving broadband service at speeds capable of supporting current and future applications. Indeed, there have been some estimates that 80-90% of new broadband deployment in Europe will be provided using vectored DSL technologies, rather than fiber-to-the-home.[4]

In addition to broadband DSL, ADTRAN continues to invest and develop innovative Business Ethernet solutions to enable the ubiquitous deployment of high-speed Ethernet services to businesses. Well defined and service level assured Ethernet services, or Carrier Ethernet services, also known as Metro Ethernet services, are delivered over DSL (copper pairs), and fiber optics. Many of ADTRAN's service provider customers have launched nationwide Metro or Carrier Ethernet service offerings using these state-of-the-art copper DSL. Although DSL is

[4] *See, e.g.*, http://fastnetnews.com/dslprime/42-d/4845-dsl-tsunami-rolling-over-europe-first-look.

typically considered a "consumer service," the advances in DSL technology discussed above have inured to the benefit of business services as well.

Metro Ethernet services are the fastest growing business service access segment.[5] Next generation Internet Protocol (IP) and Ethernet services can be delivered over DSL technologies, including SHDSL and VDSL2. Unlike the one and two pair deployments models used by residential broadband subscribers, Business Ethernet over Copper (EoC) deployment utilizes 8, 24 and even 48 pairs of copper wires to deliver even higher speeds of a Gigabit per second (Gbps) or more, and extending 100Mbps services to links of 10,000 feet or more.

On October 4, 2012, ADTRAN announced a new product that uses a breakthrough technology called "ActivReach."[6] Solutions based on ActivReach allow service providers to deliver 100 Mbps of Ethernet services at three times the distance over legacy voice grade wiring in older and historic buildings. The majority of these technology innovations are focused on copper distribution where the economics for fiber optics and other technologies are the most challenging.

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[5] *E.g.*, Vertical Systems Group, "Global Ethernet Bandwidth Surges As Legacy Networks Migrate To Higher Speeds," available at http://www.verticalsystems.com/prarticles/stat-flash-2012release-global_eth_bw_srpasses_legacy_prnews.html .

[6] *See generally*, http://activreach.adtran.com/

In sum, as demonstrated by these continuing advances in copper loop-based technologies described above, the Commission must be mindful that copper loops are not an anachronism, but instead can be a robust component of broadband service providers' "tool chest."

Respectfully submitted,

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